What is claimed is:

1. An actuator for operating upon a load having load characteristics, including

a field assembly comprising a first plurality of magnets configured to provide flux density distributions in an air gap selected as a function of the load characteristics; and

a coil assembly.

2. The actuator of claim 1, wherein dimensions of the first plurality of magnets are selected to provide the selected flux density distributions in the air gap.

3. The actuator of claim 2, wherein the first plurality of magnets are aligned in alternating groups, so that magnets in one of the alternating groups have a first polarity, and magnets in an adjacent alternating group have a second polarity opposite to the first polarity.

4. The actuator of claim 2, wherein the first plurality of magnets are positioned in a first set of aligned groups on a field blank, and at least one of the aligned groups of the first set of aligned groups includes a pair of magnets having the same polarity.

5. The actuator of claim 2, wherein the load characteristics correspond to a spring having a spring constant K.

6. The actuator of claim 1, wherein the field assembly includes a first field blank positioned to face a second field blank, the first and second field blanks each comprising a planar portion and additional sections which provide flux paths perpendicular to a direction of motion of the coil assembly, and further wherein the first plurality of magnets are positioned along the direction of motion on the planar portion of the first field blank.

7. The actuator of claim 6, wherein the first plurality of magnets are arranged in a first pattern of polarities, and further including a second plurality of magnets positioned on the planar portion of the second field blank to oppose the first plurality of magnets, and further wherein the second plurality of magnets are arranged in a second pattern of polarities which is a complement of the first pattern of polarities.

8. The actuator of claim 4, further including a second set of aligned groups of magnets positioned on an opposing field blank, wherein the first set of aligned groups are arranged in a first pattern of polarities, and further wherein the second set of aligned groups of magnets are arranged in a second pattern of polarities which is a complement of the first pattern of polarities.

9. The actuator of claim 1, wherein the first plurality of magnets is further configured to provide a flux density distribution in the air gap as a function of friction characteristics.

10. A linear actuator for operating upon a load having load characteristics, including

a field assembly comprising distributed magnet field sources which provide a flux density distribution in an air gap corresponding to the load characteristics; and

a coil assembly.

11. The linear actuator of claim 10, wherein the distributed magnet field sources are further configured to provide the flux density distribution in the air gap as a function of friction characteristics.

12. The linear actuator of claim 11, wherein the friction characteristics correspond to friction characteristic of the load.

13. The linear actuator of claim 10, wherein dimensions of the magnet field sources are selected so that the flux density distribution in the air gap

provided by the magnet field sources increases in a direction of motion of the linear actuator.

14. A linear actuator for operating upon a load having load characteristics, including

a field assembly comprising a magnet structure which includes a plurality of magnets arranged in a sequence so that at least two adjacent ones of the plurality of magnets having a first polarity are followed by at least another of the plurality of magnets having a polarity different from the first polarity, and flux distributions in an air gap provided by the sequence correspond to the load characteristics; and

a coil assembly.

15. The linear actuator of claim 14, wherein the sequence of magnets is further configured to provide a flux density distribution in the air gap as a function of friction characteristics.

16. The linear actuator of claim 15, wherein the friction characteristics correspond to friction characteristics of the linear actuator.

17. The linear actuator of claim 14, wherein the load characteristics correspond to a spring having a spring constant K.

18. The linear actuator of claim 17, wherein the dimensions of the plurality of magnets are selected so that the flux density distribution in the air gap provided by the plurality of magnets decreases in a direction of motion of the linear actuator

19. A linear actuator including

a field assembly comprising

a first field blank,

a first plurality of magnets of one polarity followed by a second plurality of magnets of a different polarity positioned on the first field blank in a direction of motion of the linear actuator, and

a coil assembly including a generally planar coil comprising a first force generating portion spaced apart from a second force generating portion so that the first force generating portion is positioned over ones of the first plurality of magnets whenever the second force generating portion is positioned over ones of the second plurality of magnets.

20. The linear actuator of claim 19, wherein the first and second pluralities of magnets are arranged in a first pattern of polarities, and further including a third and fourth pluralities of magnets positioned on a planar portion of a second field blank to oppose the first plurality of magnets and to form a gap, and further wherein the third and fourth plurality of magnets are arranged in a second pattern of polarities which is a complement of the first pattern of polarities, and the generally planar coil is moveable along the gap.

21. The linear actuator of claim 20, including additional sections extending along the planar portion of the first and second field blanks in the direction of motion, so that when first and second ones of the field blanks are positioned to form the gap, the additional sections form a flux path perpendicular to the direction of motion.

22. The linear actuator of claim 21, wherein the perpendicular flux path is a portion of an actuator flux path which extends through a magnet of the first plurality of magnets, across the gap to a magnet of the third plurality of magnets and the planar portion of the second field blank, through at least one of the additional sections and to the planar portion of the first field blank, and back to the magnet of the first plurality of magnets.

23. The linear actuator of claim 21, wherein the perpendicular flux path is a portion of an actuator flux path which lies generally in a plane perpendicular to the direction of motion.

24. A linear actuator operational in a direction of motion including

a plurality of field sub-assemblies each comprising a field blank, and wherein at least one of the plurality of field sub-assemblies includes a first sequence of magnets of one polarity followed in the direction of motion by a second sequence of magnets of a different polarity, wherein the plurality of field sub-assemblies are positioned with respect to one another to form a gap between the at least one of the plurality of field assemblies which includes the sequences of magnets, and another of the plurality of field assemblies; and

a coil assembly including coils positioned within the gap in a plane substantially parallel to the direction of motion.

25. The linear actuator of claim 24, wherein the magnets in the first sequence of magnets have different widths and the magnets in the second sequence have different widths.

26. The linear actuator of claim 24, wherein the magnets in the first sequence of magnets have substantially the same widths as corresponding magnets in the second sequence of magnets.

27. The linear actuator of claim 24, wherein at least one magnet in the first sequence of magnets has substantially the same width as at least one magnet in the second sequence of magnets.

28. A linear actuator operational in a direction of motion including

a plurality of field sub-assemblies each comprising a field blank, wherein a first one of the plurality of field sub-assemblies includes consecutive groups of magnets, each one of the consecutive groups of magnets including a plurality of magnets arranged to have a selected magnetic polarity and to produce a selected magnetic flux density distribution in an air gap, and further wherein the first one of the plurality of field sub-assemblies is positioned with respect to a second one of the plurality of field sub-assemblies to form the air gap between them; and

a coil assembly including at least one coil positioned in a plane within the air gap, wherein the plane is substantially parallel to the direction of motion of the linear coil actuator.

29. The linear actuator of claim 28, wherein the field blanks of each of the plurality of field sub-assemblies comprise a generally planar portion, and additional sections extending along edges of the planar portion in the direction of motion, so that when first and second ones of the plurality of field sub-assemblies are positioned to form the gap, corresponding additional sections of the field blanks in the first and second field sub-assemblies are adjacent one another to form a flux path perpendicular to the direction of motion for a magnet of the first field sub-assembly.

30. The linear actuator of claim 29, wherein the perpendicular flux path forms a portion of an actuator flux path which extends from the magnet of the first field assembly, across the air gap to a planar portion of the second field sub-assembly, through a corresponding additional section of the field blank of the second field sub-assembly, through an adjacent corresponding additional section and then a planar portion of the first field sub-assembly, and back to the magnet of the first field subassembly.

31. The linear actuator of claim 29, further including a sequence of magnets positioned on the second one of the plurality of field sub-assemblies, wherein the consecutive groups of magnets are arranged in a first pattern of polarities, and further wherein the sequence of magnets are arranged in a second pattern of polarities which is a complement of the first pattern of polarities, and so that the actuator flux path also includes a magnet of the sequence of magnets having a polarity opposite the polarity of the magnet of the first field subassembly.

32. A method of configuring a linear actuator having a field assembly and a coil assembly for operation upon a load having load characteristics which vary over a stroke, comprising the steps of

fashioning a magnet structure of the field assembly along a direction of motion of the linear actuator to distribute flux densities in an air gap in correspondence to the variations in the load characteristics over the stroke; and

configuring a coil of the coil assembly to be responsive to the distributed flux densities.

33. The method of claim 32, wherein the fashioning step includes the steps of

dimensioning first and second magnets, wherein the first magnet creates a first average flux density of a selected polarity to which a side of the coil is exposed, and the second magnet creates a second average flux density of a selected polarity to which the side of the coil is exposed and is positioned adjacent the first magnet to form a first group;

dimensioning third and fourth magnets to have a polarity opposite to the selected polarity, and average flux densities in the air gap to which another side of the coil is exposed corresponding to the first and second average flux densities in the air gap, respectively, wherein the fourth magnet is positioned adjacent the third magnet to form a second group, and the second group is positioned along the direction of motion in a sequence with the first group.

34. The method of claim 32, wherein the load characteristics correspond to a spring having a spring constant K, and further wherein the fashioning step includes the step of distributing flux densities in the magnetic structure to provide a variation of flux density in the air gap along the direction of motion in correspondence with the spring having the spring constant K.

35. The method of claim 32, wherein the fashioning step includes the step of selecting the physical characteristics of the magnetic structure to provide the distribution of flux density in the air gap.

36. The method of claim 35, wherein the selecting step includes configuring the width dimension of the magnet structure along the direction of motion.

37. The method of claim 35, wherein the selecting step includes the step of providing a plurality of spaced apart magnets, each providing a different average flux density in the air gap to which a coil side is exposed.

38. The method of claim 34, wherein the distributing step includes the steps of

selecting first and second magnets, wherein the first magnet has a first width and a selected polarity, and the second magnet has a second width less than the first width and the selected polarity and is positioned adjacent the first magnet to form a first group;

selecting third and fourth magnets having a polarity opposite to the selected polarity, and widths corresponding to the first and second widths, respectively, wherein the fourth magnet is positioned adjacent the third magnet to form a second group, and the second group is positioned along the direction of motion in a sequence with the first group.

39. The method of claim 32, wherein the fashioning step includes the step accounting for friction characteristics when creating a required flux density distribution in the air gap.

40. The method of claim 32, wherein the fashioning step includes the steps of

positioning the magnetic structure on a first field blank having a generally planar portion; and

forming additional sections extending along the planar portion in the direction of motion, so that when the first field blank is positioned opposite a second field blank to form the air gap, corresponding additional sections form a flux path perpendicular to the direction of motion for the magnet structure.